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Background

During the last few decades the internationalization of business has been heavy all over the world. Firms have also been eager to apply international telecommuni-cations, even though it is not clearly known, whether firms do that because of their increased international business, or whether they do more international business due to telecommunications in the first place. There is also no clear answer to how international and interorga-nizational telecommunications affect the internationali-zation of business. The previous research offers four approaches in studying this question. One of them focuses on how various information technologies and architectures fit in different internationalization strategies [Alavi and Young, 1992; Karimi and Konsynski, 1991; Steinbart and Nath, 1992]. Another approach ends to align information systems strategy with the international business strategy [Ives, Jarvenpaa and Mason, 1993]. Both of these mainly take business strategies as given while searching for appropriate information technology solutions to fit the given strategies. The third stream deals with information technology's effect on business performance [Bakos, 1987; Raymond et al., 1995], while the fourth deals mainly with the globalization of the information technology itself [Sankar et al., 1993]. None of the streams really answers the question, how information technology, and more precisely, electronic commerce, affects the internationalization of business. However, the performance studies have the right viewpoint in this matter, even though they rather talk about business performance in general than about the effects on internationalization. For example, these studies measure business performance through overall economic ratios like through ROI and sales figures [Raymond et al., 1995] without separating the influences on the international business.

In this study, information technology's effect on internationalization is studied from two points of view: First, the internationalization history and the computeri-zation history of the company are analyzed from a historical perspective. Second, a correspondence between the companies' current information technology and current international appearance including the degree of internationalization is sought. For making the study manageable, only a part of electronic commerce applica-tions, electronic customer and supplier relations, are studied in this context. So the remaining research question asks, how a manufacturing company's inter-organizational electronic connections with its customers and suppliers affect the internationalization of business within the metal industry in U.S. and in Finland.

The Research Problem

The effect of electronic commerce on a company's internationalization of business can be studied as a several years long longitudinal study, or as an one time measurement. Both approaches have their restrictions, as in the longitudinal internationalization studies it is difficult to separate the effects that have come from information technology in the fist place, and, in particular, from different applications and their various generations and versions. In one time measurements the problem comes from the fact that both causes and effects are measured at the same time, even though the real causes of the observed effects may have occurred a long time before observation. In this study, both some of the long and short term effects are tried to be caught by the same questionnaire. The long term effects are studied retrospectively by searching for a connection between the computerization history and the internationalization history of the company. This will not produce any detailed information, but it may still reveal some connections between the studied companies' current degree of internationalization, and the decisions that were made on information technology in the past. The more short term effects are inspected by searching for a correlation between the current interorganizational connections and the current degree of internationali-zation. There is a chance that the observed influences do not come from the current but from earlier applications, but by the survey

we know at least something about the very recent and earlier development concerning these applications. Also, repeating this study later might catch the effect of current electronic connections more reliably. The research problem is illustrated in Figure 1, where the main research hypotheses are:

H1: Active and continuous adoption of information technology during a long period of time will correlate with active and continuous internationalization process.

H2: Strong electronic connections with customers will increase the degree of internationalization.

H3: Strong electronic connections with suppliers will increase the degree of internationalization.

There are also four additional research questions to support the main hypotheses. The questions are:

Q1, Q2: Do firms with different types of production and with different customer/supplier relations have different electronic connections and international appearance?

Q3: Do public information technology infrastructures affect the location of the companies' international manufacturing and marketing units?

Q4: Do the companies' dependence on the information technology infrastructures and the information technolo-gical state of the environment correlate with each other?

The individual research variables are:

1) Company variables:

- type of production
- necessity of customer relations
- necessity of supplier relations
- internationalization objectives
- dependence on telecommunication infrastructures

2) Environmental variables:

- information technological state of environment

3) Characteristics of electronic commerce:

- computerization history
- degree of computerization
- strength of electronic customer relationships
- strength of electronic supplier relationships
- interorganizational information systems strategy
- recent changes in telecommunications

4) International appearance

- internationalization history
    - degree of internationalization
    - recent changes in the degree of internatio-nalization
    - marketing manager's evaluation of the telecom-munications' effect
    - MIS manager's evaluation of the telecom-munications' effect.

The information technology's effect on interna-tionalization is measured through a compound variable called the *international appearance* of the company. This reflects both performance, structural and attitudinal aspects of internationalization, which are the most used aspects in measuring the *degree of internationalization* [Sullivan, 1994]. The individual sub variables behind the degree of internationali-zation include such earlier validated variables [Sullivan, 1994] as the number and geographical spread of manufacturing, sales and purchasing units, and the value and development of foreign sales. The concept of international appearance also includes the internationalization history of the company, and the managers' evaluation of the firm's internationali-zation. For having a simple measure, the internatio-nalization history is expressed as years of major steps in the company's international development. The managers' subjective evaluation has been used earlier [Sapienza et al., 1988, Raymond et al., 1995], and here it offers a verbal form for the phenomena that are simultaneously studied statistically.

The *characteristics of electronic commerce*, whose effect on the international appearance and the degree of internationalization is studied here, is measured analogi-cally with the international appearance of the company. So the variable includes both a historical part measured as years of major steps in the company's computeri-zation, and a part that indicates the current state of the company's electronic commerce. The sub variables indicate how well the company's international organization is equipped with a computing power and telecommunications, how strong electronic connections the company has with its suppliers and customers, and what kind of strategy the company applies in building interorganizational electronic commerce applications. These characteristics may directly affect the internationa-lization process of the company, but there is a good reason to believe that this effect is somehow connected with some other variables describing the *company* and its information technological *environment*. For example, firms with different types of production (from standar-dized production to one of a kind production) create different customer relations (whose length and intensity of interaction vary), and therefor they are likely to have different electronic commerce applications, and different internationalization effects. Also, firms that have a different amount of power in their supplier and customer relations may experience different effects of applying electronic commerce in these relations [Steinberg, 1988].

The *environmental variables* may affect the described effect mechanism in a way that firms who are dependent on the information technology infrastructures choose to expand to such international areas where infrastructures are satisfactory. This is, however, difficult to confirm, because, even though dependent on infrastructures, firms may appreciate other environmental factors like the size and growth rate of the market even higher than the quality of infrastructures. Also, firms that are powerful enough may build their own telecommunications and enter the market regardless of infrastructures. Still, firms that are not capable to do this may choose to expand to areas, which can satisfy their environmental needs.

Research Design And Methods

The research is carried out as a mail survey among U.S. and Finnish metal industry companies. All studied companies are manufacturing firms, and approximately 15 largest firms per SIC code are selected in the study. In the U.S. study companies represent 20 different SIC codes, so that there are equal groups of industrial machinery, transportation equipment, and electric and electronic equipment manufacturers. The total number of companies is 300, of which 90 make the first group, and 105+105 the two other groups. The Finnish sample will be determined in a detail after completing the U.S. study.

The questionnaire is constructed of two parts, of which the internationalization part is sent to marketing managers and CEOs, and the computerization part to MIS managers. An early version of the questionnaire was used in personal interviews in four Finnish metal industry companies in 1992. The questionnaire was then altered for this study, and validated by comparing its variables with other studies. Also some

conceptual validation was carried out in one international company in Dallas. The mailing package was designed according to the TDM method [Dillman, 1978].

Expected Contribution

The study is expected to give evidence of the electronic customer and supplier relations' connection with the degree of internationalization in the manufacturing metal industry companies. For example, strong electronic customer and supplier relations should correlate with increasing international sales, and with longer or more confirm customer relationships. Also, high electronic connection volumes with customers and suppliers should together with other indicators correlate with a high degree of internationalization. The recent changes in telecommunications should correlate with the recent changes in the degree of internationalization, and thereby reveal if the very latest electronic commerce applications have any effect on the international sales and on the size of the international market area. The study is also expected to show potential connections with the internationalization history and the computerization history. For example, if there are one or more peaks in the companies' international operations soon after taking new international telecommunications and applications in use, that might indicate increased international business activity that is boosted by telecommunications. The named correlations are quite evident, but there is not much empirical evidence to support them. Therefor any evidence that is received by this study may be considered as a contribution to the research field in question.

Discussion

In the U.S. response rates are often low in mail surveys, and there is a risk of not receiving enough answers for this study either. The risk may even be higher because of needing two answers from each company, even though involving two respondents may also encourage people to answer. In this case, the effect of low response rates may, however, be diminished because of the very homogeneous research sample, and because of the even more homogeneous sub samples. Also the very explorative nature of the study may make the whole design valuable regardless of response rates. (While the collection of answers is still going on, the preliminary response rates are: 14 % in the whole U.S. study, 17 % in the industrial machinery group, 15 % in the transportation equipment group, and 11 % in the electronic equipment group.)

References

References available upon request from author.